## MAINTENANCE OF SAW MILL MACHINERY.

DOUBTLESS our placing circular saw mills in the list of machines that require care will provoke a smile from those who know how very little of such consideration this kind of machinery receives.

It may be of interest to the uninitiated to go with us for a few minutes into one of these institutions with its modern appliances. We may find a little standing room near the sawyer. Through a cloud of sawdust may be seen a large log lunging back and forth, while the savage saw cleaves board after board from its side. The head block man is riding the carriage and hanging on to his levers like a sailor clings to his rigging during a storm. Suddenly the carriage stops. One naturally takes a step backward as two timbers, armed with spike, dart through the floor nearby. The log bounds into the air and drops back on the blocks with a fresh side presented to the saw, and the turning jack disappears. Again the sawdust and bark flies; a great slab drops on the live rolls and wriggles away out of sight. A few more such snatches at the log and it disappears.

We have seen enough and breathe easier when a little farther away, for such violent motions and rasping sounds produce a sense of insecurity. The whole thing seems to be turned loose to do what it can before it accomplishes its own destruction. Of course the practical saw mill man looks upon this slamming and banging of things with a sort of matter of course complacency. Experience has taught him about where the boundary of endurance lies and he works right along that line.

It is only by dint of increased strength and the use of steel where cast iron is commonly used that this kind of machinery is made fairly durable. In view of the rough usage it gets, we need not wonder at its ranking among the most expensive as to cost of maintenance. It may also be said to demand a higher order of skill for its successful management than many might suppose it would require.

We have examined a mill that will cut 50,000 feet of lumber per day, which is quite a different thing from one that can only cut from 3,000 to 5,000 feet. As there are fifty perhaps of the latter to one of these larger mills, we will confine what may be said on the subject to the operation of the greater number.

It would be perfectly useless to attempt to harmonize the views of sawyers on many subjects connected with the management of saws, as well as other parts of a mill. Hence we are not in the field as a missionary to change men's ways of thinking, but, if possible, to throw out a hint here and there which may be of value to some.

First, as to power required: Any good engine with saw in fair order will cut about 3,000 feet of one inch boards in ten hours for each ten h.p. developed. That is to say, a thirty h. p. engine will cut 9,000 feet per day, or at least can be made to do so. We are aware this is more than the average performance; in many cases it is nearly double what is done.

It may be interesting to note how much of the time a saw must be idle during each day or hour. For an example, take 400 revolutions for a saw per minute, and a feed of one inch to each revolution, which is a low average for a 15 h. p. engine. At this rate the saw makes 24,000 turns per hour, and allowing that it is only cutting two-thirds of the time, the balance being consumed in backing the log, then we have 16,000" cut, or the equivalent of 1,333 feet per hour, and in ten hours 13,330 feet board measure, allowing the timber sawed to be twelve inches wide. An average day's work for such a mill may be estimated at about 5,000 feet, so we may see about how much of the time is consumed in turning the logs, putting them on the blocks and, as we sometimes say, pottering around.

The management of the circular saw seems to be the sawyer's shibboleth. Yet he may not have any well defined line of action. For instance, we know of no rule for determining the number of teeth that a circular saw should have. It is generally understood, however, that where coarse feeds are used, say from three to six inches to a revolution of the saw, that the saw teeth may be spaced to about three inches apart, while with small powers and fine feeds, say one-half to two inches, the saw teeth may be as much as six to eight inches apart. Indeed, we have known some cases where these spaces were doubled with apparent advantage. This was where the power was very limited, of course.

It is readily seen that sixteen teeth and one inch feed, thirty-two teeth, with two inch feed, and sixty-four teeth, with four inch feed, will each require power corresponding to their number of teeth, as in each case every tooth cuts chips one-sixteenth of an inch in thickness. But should we use a saw with thirty-two teeth on a feed of one-half inch we find that each tooth cuts but one sixty-fourth of an inch, or what might be considered as mere scraping, and as much power will be consumed, in all probability, in doing this as would be required to cut a chip twice or three times as thick. Hence, we may see there may be a great waste of power by having too many teeth in a saw.

From the foregoing we may reasonably conclude that one tooth to the horse power to be applied would not be far from the proper thing, that is, sixty teeth for sixty h. p., thirty teeth for thirty h. p, and one tooth for one h. p. But, as saw mills never get much below ten h. p., we would not require any one-tooth saws. They have been made, however, with four teeth, and successfully used, we are told. It is needless to say anything about thick or thin saws further than this: When required as thin as ten to twelve gauge, the motion should be both steady and rapid. Both being very hard to secure with limited power, such as small mills usually employ, it is probably best to use heavier saws in such mills.

Perhaps velocity has more to do with making thin saws work well than any other condition. The effect of centrifugal force, which the rapid speed produces on the saw blades, is well understood by saw makers. This, together with the driving strain, take effect principally at the central portion of the saw, and so stretches the steel at this point that it becomes necessary to provide for this change by hammering when in the hands of the saw maker, and by his knowing the velocity at which a saw is to run, he can make the proper allowance for this expansion.

It is well known that heat, so often produced by friction, is one of the most troublesome things the sawyer has to contend against. The derangement of the saw thus produced by unequal expansion cannot be provided for by the maker.

It sometimes happens, however, that a saw may be hammered a little too "tight" at the centre, and then its performance will be improved by becoming warm at this point. It is often a matter of surprise to see how a very little heat will affect the running of a circular saw, the sun's rays being sufficient to unfit it wholly for work. Great damage often comes to a saw by cooling it with water. Those acquainted with the nature of metals know that when heated and allowed to cool gradually, a thing will come much nearer assuming its original shape than it will do if cooled suddenly, so that saw being frequently cooled in this way will soon require re-hammering.

The preventatives against undue friction and heat are too well known to require much comment. Usually, of course, it results from not giving the saw teeth sufficient spread to make a free curf. Sometimes the cause is more remote, and may be traced to improper setting of the mill frame, or carriage. For instance, if the saw-arbor is not perfectly level, the effect will be to spring the saw, as the latter will obviously lop over at the top, toward the carriage, if this end of the arbor is low, and at same time the under half of the saw will spring in the same direction. Just what the effect of all this will be on the cutting qualities of the saw cannot be foretold, but it is safe to say it will not be likely to cut a truly straight line, and therefore will be very apt to rub on the timber and become warm, or possibly hot in spots.

The same effect may be produced by allowing the trackway to get in wind, as it is called, or in other words, out of level.

It is useless, perhaps, to say much about the forms of dress given saw teeth by different sawyers. A diversity of opinion will doubtless always exist on this subject.

There are really but two prominent differences, i. e., that known as the "briar tooth" and the "chisel tooth." The first, of course, must be bent right and left alternately to give proper width to the curf they cut.

One objection to this form is, that these teeth may be sprung back by the pressure of the cut, and another is, that the lumber cut will not be as smooth as when every tooth is made to cut on each side, as is the case with teeth that are spread at the points equally on each side, giving them the form of a chisel. Some combine these two forms in the saw, by following a chisel tooth with two briar teeth, one right and the other left handed, a form which is sometimes employed in hand saws.

Of the several plans named, we believe that of the uniformly swaged tooth, or chisel shape, is the most generally used.

A word with reference to the manner of upsetting the steel to form this tooth, may not be out of place. This should be done with light strokes of the hammer. Heavier ones are liable to shatter and destroy the texture of the steel.—"Quirk," in the Tradesman.

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White poplar weighs 33.06 pounds to the cubic foot.

Well-dried locust weighs 45.05 pounds to the cubic foot.

Seasoned dogwood weighs 47.05 pounds to the cubic foot.